Der Eläolithsyenit der Serra de Monchique, seine Gang- und Contactgesteine. By K. v. KRAATZ-KOSCHLAN and V. HACKMAN. Tschermak's Mineralogische und Petrographische Mittheilungen, Vol. XVI, pp. 197–307, Pls. IV and V. 1896.

The rock making up the mass of the Serra de Monchique in the southern part of Portugal, first described as "granite" by Bonnet in 1850, was later recognized as a new type by Blum in 1861, and by him given the name *foyäite*, from the dominant peak of the range. It is today known as the foyäite type of the elæolite syenites. The present paper, while largely taken up by detailed petrographic descriptions, is professedly a study of the geological relations of the various rocks.

The elæolite syenite *massif* is roughly elliptical in area, with its longer axis, 15.5 kilometers, extending nearly east and west. Its breadth is about 5.5 kilometers. It consists essentially of two main mountain ridges, separated by the northeast and southwest valley in which the village of Monchique lies. The more easterly of these two ridges takes its name of the Picota from its dominant peak (774 meters), while Mount Foia (902 meters) lends its name to the western ridge. The whole elliptical area is enclosed by the shales and sandstones of the Culm, and the intrusion probably took place within Carboniferous time.

A zone of contact metamorphism was traced around a large portion of the area, and is assumed to completely surround it. Near the contact the normal syenite becomes finer grained, and is either a mica-foyäite, in which the non-micaceous dark minerals have almost disappeared, or has the usual ægirine-augite replaced by ægirine. These changes are accompanied by the addition of låvenite, spinel, and tourmaline. The surrounding metamorphosed sediments consist of altered quartzose *grauwacke*, black *hornfels*, and *knotenthonschiefer*. A cordierite-mica-hornfels which occurs as an inclusion in the elæolite syenite is regarded as an altered diabase. So-called "diabase hornfels" occurs in two places in the metamorphic girdle and is assigned a similar origin. The width of the contact zone varies from a few meters to over a hundred meters, but is in general not so wide as would have been expected in the case of an intrusive granite mass of equal size. It is considered that the alteration was conditioned by the temperature of the eruptive mass and not, to any great extent, to pneumatolytic processes.

Numerous dikes cut the syenite massif but have not been traced

into the surrounding sedimentary rocks. Their strike is generally north and south, northeast and southwest, and northwest and southeast. Only one was noticed with an east and west strike, and their course is accordingly frequently nearly at right angles to the trend of the mountains. They are most commonly from one-half to one meter in width, the monchiquites being particularly variable. As a whole they form a series of differentiated rocks genetically related to the main elæolite syenite. The observed types are: bostonite-porphyry, tinguaite, nepheline-syenite-porphyry, camptonitic tinguaite, and camptonitic and monchiquitic rocks.

The petrography of all the rocks mentioned has been worked out with considerable detail, and is accompanied by several chemical analyses, forming a valuable contribution to the literature of these interesting types. It is shown that the nepheline-syenite of the Foia is poorer in the nepheline than the rock of the Picota, and closely resembles the pulaskite of Arkansas. It presents many features which point to a quicker solidification at less depth than is indicated in the case of the Picota facies. The study of the dike rocks brings out many interesting and suggestive points which can only be referred to in a brief review. With the suggestions embodied in Pirsson's recent paper[1] on the analcite series of rocks in mind, the rôle played by that mineral in these Portuguese rocks, and the description of a so-called "leucite-tinguaite-vitrophyre" with its high alkali contents and devitrified glassy base, become doubly interesting.

The microscopic petrography of the altered sediments is minutely described, and the paper ends with an excellent summary, in which the general sequence of the intrusive activities is presented. The plutonic mass of the Picota, slowly cooled at great depth, is the oldest portion of the *massif*, and probably also underlies the rock of the Foia, which is regarded as an already somewhat differentiated, more acid, upper portion, which solidified nearer the original periphery of the mass. Certain *schliere* in the Picota area are similar to the rock of the Foia. Corresponding to these more acid differentiation products, are the tinguaite dikes, as later intrusions or *Nachschübe*. Basic differentiation products are represented by slowly cooled theralitic rocks (essexite and teschenite), and their corresponding dikes of the camptonite-monchiquite series. These rocks are thought to be younger than the tinguaites, but no satisfactory evidence was obtained

[1] This JOURNAL, Vol. IV, p. 679.

on this point. The youngest intrusion of all is represented by the leucite-tinguaite-vitrophyre.

It is to be noted that the process of differentiation here described, inasmuch as the more acid facies of the elæolite syenite occur on the periphery of the mass, differs from those described by Brögger, in which the more basic constituents have tended to migrate toward the cooling surface. This difference, coupled with the fact that the authors refer only once, very casually, to the whole intruded *massif* as a laccolite, gives cause for regret that they were not able to devote more time to the study of field relationships than was actually at their disposal.

F. L. RANSOME.

Geological Survey of Canada. G. M. DAWSON, Director. *Ann. Rept. U. S.*, Vol. VII, 1894. Ottawa, 1896.

The summary report of operations is followed by a report on the area of the Kamloops map-sheet by Dr. G. M. Dawson, a report of an exploration of the Finlay and Oomenica rivers by R. G. McConnell, a report upon the country in the vicinity of Red Lake and part of Berens River, Keewatin, by D. B. Dowling, a report upon a portion of the eastern part of Quebec, by R. W. Ells, with a chapter upon the Laurentian north of the St. Lawrence, by F. D. Adams, a report upon the surface geology of portions of New Brunswick, Nova Scotia, and Prince Edward Island, by R. Chalmers, and the usual statistical tables and notes on the analyses and collections made.

Within the year an important change in the management of the survey occurred, Dr. A. R. C. Selwyn, who had served as director since the retirement of Sir W. E. Logan in 1869, being granted leave of absence and the following January receiving superannuation. Dr. G. M. Dawson, his successor, was recalled from the field early in October and has since been in charge of the work. Twelve parties were in the field. Dr. Dawson himself spent some time in the Kamloops and adjoining regions investigating recent mining developments. In the Cariboo mining districts the study of the changes in drainage consequent upon glacial conditions was undertaken as likely to yield important results as to the distribution of the auriferous river gravels. The history of these gravels and their association with the glacial beds is traced in detail in the Kamloops report. Mr. R. G. McConnell spent the season in the foot-hills of western Alberta and in the south-